Arctic Sea Ice Flux into the Greenland and Barents Seas

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We estimate the Arctic ice flux through the following passages: Fram Strait; Svalbard and Franz Josef Land; and, Franz Josef Land and Novaya Zemlya. The area flux estimates are based on ice motion derived from satellite passive microwave fields. The area flux record spans a period of eighteen years (1978 through 1996). Near the Fram Strait, we estimate the volume flux using ice thickness estimates from available upward-looking sonar measurements - this record covers a shorter period between 1991-1996. Over the record, the average Fram Strait ice area flux in the winter (October through May) is 670,000 km^2 and ranges from a minimum of 450,000 km^2 in 1984 to a maximum of 906,000 km^2 in 1995. The average winter volume flux over the winters of Oct 1990 through May 1995 is 1745 km^3 with a low of 1375 km^3 in 1990 and a high of 2791 km^3 in 1995. The average winter ice area flux through the Svalbard/Franz Josef Land (S/FJL) and Franz Josef Land/Novaya Zemlya (FJL/NZ) passages are 35,000 km^2 and 64,000 km^2, approximately 5% and 10% of the area flux through the Fram Strait. The total sea ice area exported through the three passages is approximately 8% of the area of Arctic Ocean - dominated by the area export through Fram Strait. We find a significant correlation (R=0.86) between the Fram Strait ice flux and the North Atlantic Oscillation (NAO) index. The winter area flux through the S/FJL and FLJ/NZ passages are both negatively correlated (R=-0.14), although less significantly, to the NAO index. We show that both positive and negative correlations of the ice flux with the NAO index can be explained by the spatial distribution of the sea level pressure due to the intense Icelandic low during the positive phases of the North Atlantic Oscillation.

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